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ERGONOMICS: A NEW SCIENCE FOR MAN

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16. Abstract Research is being conducted at the Division of Ergonomics of the All-Union Scientific Research Institute of Technological Esthetics to analyze the human operator's functions and, on that basis, to design machinery and plan for it its efficient use. Electroencephalographs, electromyographs, electrocardiographs, electrooculographs, and apparatus for measuring galvanic reactions of the skin, etc. measure the operator's activity as he works at a stand simulating a machine (see illustrations). Data collected by computer are then used in the design of the actual machine. For example, the Division of Ergonomics reorganized a section of a chemical plant by analyzing the existing situation (scattered machine aggregates, conflicting sizes, colors, control, illogical control sequences, etc.) and altering it accordingly (centralization, standardization, etc.). Subsequent results showed that improved man-machine interfaces can drastically increase output.

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ERGONOMICS: A NEW SCIENCE FOR MAN

L. Chaynova

Ergonomists Are Working in Close Cooperation with Designers at the All-Union Scientific Research Institute of Technological Esthetics

/18*

Ergonomics as a science developed comparatively recently. But specialists, taking part in it, perceive a growing interest in it each year. Ergonomists scarcely have time to satisfy the numerous requirements of workers in industrial enterprises.

The work "ergonomics" was first used in England in 1949. It consists of two Greek words: "ergon" -- work, and "nomos" -- a law.

Nowadays, ergonomics is a science, which studies man's interaction with the work that surrounds him, the work of articles, and technology which man uses and the space which surrounds him. The aim of ergonomics is the best possible use of work conditions and way of life, designing comfortable conditions for work in the very widest sense of this word.

Ergonomics is a complex experimental science. By evaluating whether working conditions are comfortable or uncomfortable in a certain production process, the ergonomist is satisfied not only by the subjective attitude of the worker himself to it or even by the results of his work. The ergonomist must know what this result has cost, what is the price in nervous and physical effort for high work efficiency, is a person's organism too overloaded when carrying it out. This type of evaluation can only be done by using objective psychophysiological research methods which make it possible to spot the smallest shifts in the organism.

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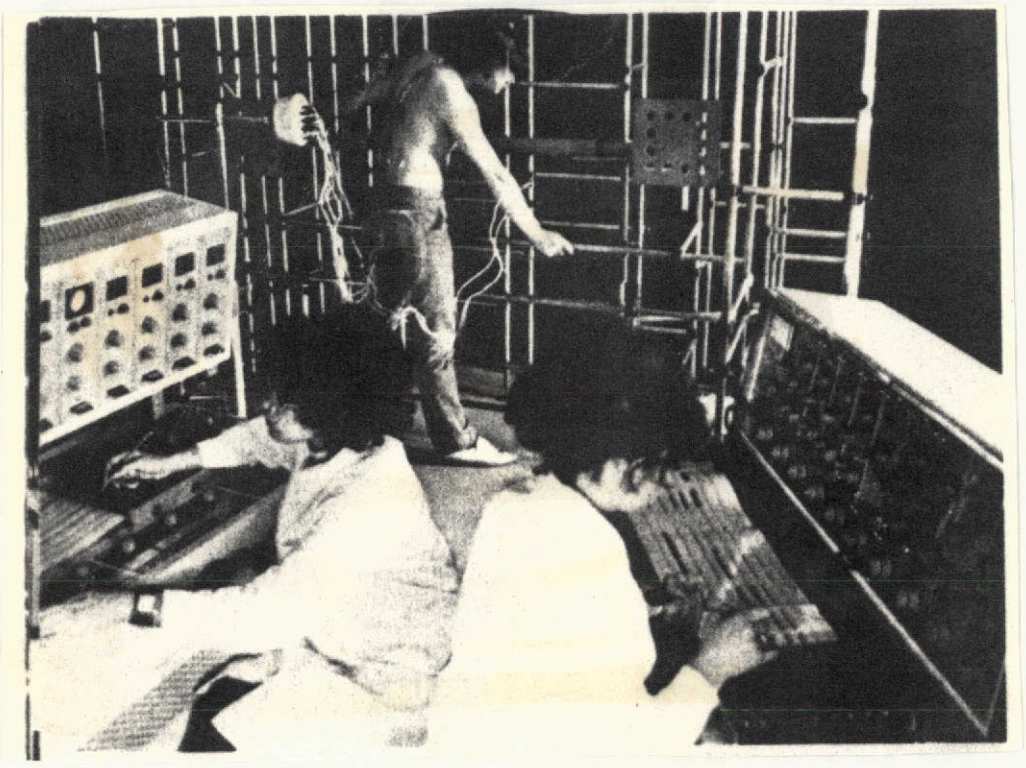
* Numbers in the margin indicate pagination in the foreign text.

In the Division of Ergonomics at the All-Union Scientific Research Institute of Technological Esthetics, a series of objective indicators are being used, such as eletroencephalographs -- for recording the electrical activity of the brain; electromyographs -- for recording muscle action potential, which plays an important part when evaluating the condition of a person's muscle and his posturewwhen working; the galvanic reactions of the skin -- the change in the difference of skin potentials; electrocardiographs -- for recording the electrical activity of the heart; electrooculographs -- for recording the potential when the eyeball is turned.

Ergonomists and artistic designers at the VNIITE [All-Union Scientific Research Institute of Technological Esthetics] have played an active part in improving the management of the leading division of the Shchekino chemical combine -- in ammonia production. There, they studied and analyzed the organization of management, the automation system, methods of issuing information to operatives and reasons for infringement of operating conditions. Comprehensive analysis brought to light a number of faults which were /19 corrected by the ergonomist and, as a result of which, reserves were found for increasing the efficiency of this production. Ergonomists suggested organizing the control of the main assemblies directly from a central position. Previously, an operator had looked after each assembly separately, continually walking from one to the other. This caused nervous and mental tension and people became very tired.

What Sort of Science is Ergonomics? What Does It Give to Mankind? How Effective Are Its Practical Recommendations?

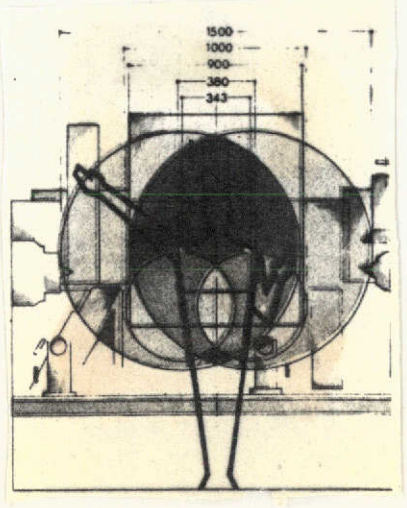
Many instruments were subjected to ergonomic investigation. They were too hetereogenous in dimension, shape, scale structure and color. On some instruments it was difficult to discern the readings on account of the shine caused by the embossed lid of their facepiece. There were also some infringement of the

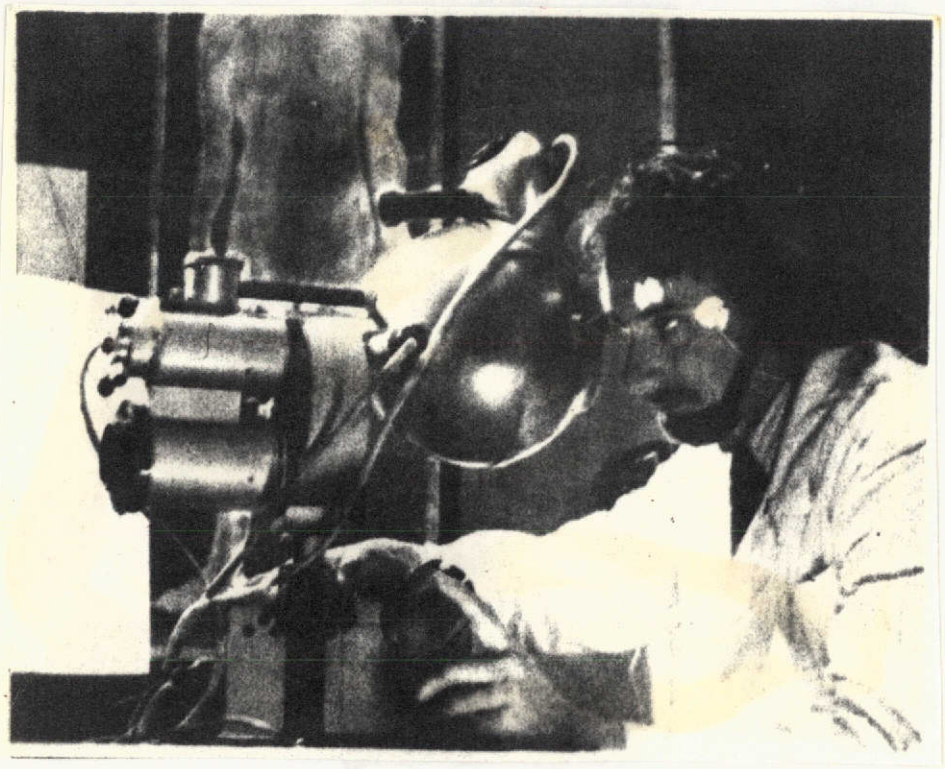


In the photographs: work on a new machine begins on a "flexibl "flexible" test bed. Objective data on muscular activity is afterwards incorporated into the design.

The photograph was taken during an experiment in a light-and soundproof chamber at the Division of Ergonomics of the VNIITE. Investigation was done on the possibility of using an oculomotor in perceiving visual information.

This type of work helps to determine the optimum space areas where a person is capable of maximum reaction speed.





principles for placing control members relative to the instruments which they were controlling: some stood from right to left, others the reverse. This caused the operators to make errors and made the training of workers more difficult.

When all these faults were corrected, the number of personnel at the central control point was reduced from 49 to 29. They succeeded in creating an optimum production operation, in reducing the number of infringement of production processes and improving working conditions.

Here is another example. In order to carry out an ergonomic experiment, two controller working positions were set up in the VNIITE: one was a standard, produced by the Leningrad "Electropul't" Plant; the other was a new one designed by workers at the VNIITE. Ergonomic requirements were taken into account in the second model, where the most important instruments were at the operator's eye level, and the plane of the investigated surface was

perpendicular to the line of vision. The result was unexpected even for the ergonomists: the speed for visual recognition of information at the new position was increased by 20%, and the number of errors of the duty controller was reduced by 14%.

What is the future for this new science? It lies in the close cooperation of ergonomists and design engineers. Engineers must redesign and create not simply machines, but systems, consisting of technical units and servicing personnel for them. This will be a new stage. It requires engineers and ergonomists to evaluate and measure human parameters which are still not being used in technology.